

STIRLING/PULSE TUBE HYBRID CRYOCOOLER  
WITH GAS FLOW SHUNT

ABSTRACT OF THE DISCLOSURE

5 A two-stage hybrid cryocooler includes a first-stage Stirling expander having a first-stage regenerator having a first-stage-regenerator inlet and a first-stage-regenerator outlet, and a second-stage pulse tube expander. The second-stage pulse tube expander includes a second-stage regenerator having a second-stage regenerator inlet in gaseous communication with the first-stage regenerator outlet, and a second-stage regenerator outlet, and a pulse tube having a pulse-tube  
10 inlet in gaseous communication with the second-stage regenerator outlet, and a pulse-tube outlet. The second-stage regenerator and the pulse tube together provide a first gas-flow path between the first-stage regenerator and the pulse-tube outlet. A pulse tube pressure drop structure has a pulse-tube-pressure-drop inlet in gaseous communication with the pulse-tube outlet, and a pulse-tube pressure-  
15 drop outlet, and a gas volume is in gaseous communication with the pulse-tube pressure-drop outlet. A gas flow shunt provides gaseous communication between the first-stage regenerator and the pulse-tube outlet. The gas flow shunt provides a second gas-flow path between the first-stage regenerator and the pulse-tube outlet.